WHAT IS CLAIMED IS:

1. A method for determining characteristics of a film on a wafer in a processing chamber, said method comprising:

impinging optical radiation upon said film;

sensing optical radiation reflected by said film to form spectral signals containing information concerning interference fringes; and

obtaining thickness information of said film as a function of a periodicity of said interference fringes.

2. The method as recited in claim 1 wherein measuring said thickness further includes obtaining wavelength information from said spectral reflectance signals by mapping said spectral signals to a wavelength domain, defining wavelength domain information, and forming a reciprocal pattern of said wavelength domain information.

3. The method as recited in claim 1 further including mapping said thickness information into a frequency domain and determining a thickness of said film as a function of frequency.

4. The method as recited in claim 3 further including determining an etch rate of said film as a function of a change in said frequency during an interval of time.

5. The method as recited in claim 1 wherein sensing optical radiation reflected by said film further includes collecting, with a lens assembly, cylindrical radiation reflected from a subportion of said film.

6. The method as recited in claim 1 wherein sensing optical radiation reflected by said film further includes collecting, with a lens assembly, said reflected radiation and collimating said reflected radiation with said lens assembly.

7. The method as recited in claim 1 wherein said optical radiation reflecting from said wafer includes a first bundle of rays reflecting from a first interface and a second bundle of rays reflecting from a second interface, with said first interface being defined by a boundary of said film and said wafer, and said second interface being defined by a boundary of said film and an ambient, with said interference fringes being formed from interference of said first and second bundle of rays.

8. The method as recited in claim 1 wherein impinging optical radiation further includes exposing said wafer to plasma to produce optical radiation.

9. The method as recited in claim 1 wherein impinging optical radiation further includes exposing said wafer white light.

10. The method as recited in claim 1 wherein said wafer further includes a layer disposed between said wafer and said film, and further including mapping said thickness information into a frequency domain as a plurality of peaks, with a first of said plurality of peaks be centered about a first frequency and a second of said plurality of peaks being centered about a second frequency, with said first frequency corresponding to a thickness of said film and said second frequency corresponding to a thickness of said layer.

11. A method for determining characteristics of a film on a wafer, said method comprising:

impinging optical radiation upon said film;

sensing optical radiation reflected by said film to form spectral reflectance signals;

plotting said spectral reflectance signals as intensity versus wavelength, defining wavelength domain information;

producing a reciprocal pattern by replotting said wavelength domain information as intensity versus a reciprocal of said wavelength, with said reciprocal pattern being defined as $1/\lambda$; and

obtaining frequency information associated with said reciprocal pattern by mapping said reciprocal pattern into a frequency domain and determining film characteristics as a function of said frequency information, said film characteristics including a thickness of said film.

12. The method as recited in claim 11 wherein said wafer further includes a layer disposed between said wafer and said film and obtaining frequency information further includes mapping said thickness information into a frequency domain as a plurality of peaks, with a first of said plurality of peaks being centered about a first frequency and a second of said plurality of peaks being centered about a second frequency, with said first frequency corresponding to a thickness of said film and said second frequency corresponding to a thickness of said layer.

13. The method as recited in claim 14 further including determining an etch rate of said film as a

function of a change in said first frequency during an interval of time.

14. The method as recited in claim 13 wherein sensing optical radiation reflected by said film further includes collecting, with a lens assembly, cylindrical radiation reflected from a subportion of said film.

15. The method as recited in claim 14 wherein sensing optical radiation reflected by said film further includes collimating said cylindrical radiation with said lens assembly.

16. The method as recited in claim 15 wherein said optical radiation reflecting from said wafer includes a first bundle of rays reflecting from a first interface and a second bundle of rays reflecting from a second interface, with said first interface being defined by a boundary of said film and said wafer, and said second interface being defined by a boundary of said film and an ambient, with said interference fringes being formed from interference of said first and second bundle of rays.

17. The method as recited in claim 16 wherein impinging optical radiation further includes exposing said wafer white light.

18. The method as recited in claim 16 wherein impinging optical radiation further includes exposing said wafer to plasma to produce optical radiation.

19. An apparatus for determining characteristics of a film on a wafer, said apparatus comprising:

means for impinging optical radiation upon said wafer;

means for sensing optical radiation reflected by said film to form spectral signals containing information concerning interference fringes;

means for measuring characteristics of said film as a function of a periodicity of said interference fringes, said characteristics including thickness.

20. An apparatus for determining characteristics of a film on a wafer, said apparatus comprising:

a processing chamber to contain said wafer;

a system to generate optical radiation, with said optical radiation impinging upon said film;

a spectrum analyzer having a detector in optical communication with said processing chamber to sense optical radiation reflected by said film and resolve, from said optical radiation, spectral signals containing information concerning interference fringes;

a processor in electrical communication with said spectrum analyzer; and

a memory in electrical communication with said processor, said memory comprising a computer-readable medium having a computer-readable program embodied therein, said computer-readable program including a set of instructions to cause said processor to operate on said information and obtain thickness information of said film as a function of a periodicity of said interference fringes.

21. The apparatus as recited in claim 20 wherein said set of instructions further includes a subroutine to cause said processor to operate on said spectral signals to obtain wavelength information therefrom by mapping said spectral signals to a wavelength domain, defining

wavelength domain information, and forming a reciprocal pattern of said wavelength information.

22. The apparatus as recited in claim 20 wherein said set of instructions further includes an additional subroutine to cause said processor to map said reciprocal pattern into a frequency domain and determine said thickness as a function of frequency.

23. The apparatus as recited in claim 20 wherein said set of instructions further includes a first subroutine to cause said processor to map said reciprocal pattern into a frequency domain and determine said thickness as a function of frequency and a second subroutine to determine an etch rate of said film as a function of a change in said frequency over an interval of time.

24. The apparatus as recited in claim 20 further including a plasma generation apparatus in data communication with said processor to generate a plasma within said process chamber, wherein said system to generate optical radiation includes a light source.

25. The apparatus as recited in claim 20 further including a lens assembly disposed between said processing chamber and said detector to collimate radiation reflected from said film.

26. The apparatus as recited in claim 20 further including a lens assembly disposed between said processing chamber and said detector to collect cylindrical radiation reflected from said film.

27. An apparatus for determining characteristics of a film on a wafer, said apparatus comprising:

a processing chamber to contain said wafer;

a system to generate optical radiation, with said optical radiation impinging upon said film;

a lens assembly disposed between said processing chamber and said detector to collect cylindrical radiation reflected from said film and collimate said cylindrical radiation, defining collimated radiation

a detector in optical communication with said lens assembly to sense said collimated radiation;

a spectrum analyzer having a detector in optical communication with said lens assembly to sense said collimated radiation and produce spectral signals having information concerning interference fringes, with said spectrum analyzer producing data corresponding to said interference fringes;

a processor in data communication with said spectrum analyzer; and

a memory in electrical communication with said processor, said memory comprising a computer-readable medium having a computer-readable program embodied therein, said computer-readable program including a set of instructions to cause said processor to operate on said data to obtain thickness information of said film.

28. The apparatus as recited in claim 27 wherein said set of instructions further includes a subroutine to cause said processor to operate on said data to obtain said thickness information as a function of a periodicity of said interference fringes.

29. The apparatus as recited in claim 28 wherein said sets of instructions further includes an additional subroutine to obtain wavelength information from said spectral signals by mapping said signals to a wavelength domain, defining wavelength domain information, and forming a reciprocal pattern of said wavelength information.

30. The apparatus as recited in claim 29 further including a second set of instructions to cause said processor to map said reciprocal pattern into a frequency domain and determine said thickness as a function of frequency.

31. The apparatus as recited in claim 30 wherein said second set of instructions further includes a first subroutine to determine an etch rate of said film as a function of a change in said frequency over an interval of time.